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PRELIMINARY RESULTS: FUDS MUNITIONS CONSTITUENTS STUDY

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Agenda

- Study Outline
- Site Description and Preliminary Summary of Results
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  - Former Camp Maxey
  - Former Conway Bombing & Gunnery Range
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Study Outline

- Selected 6 Formerly Used Defense Sites (FUDS) used during WWI/WWII
- Sampled at areas with most potential for contamination (open burn/open detonation (OB/OD), targets, firing points)
- Analyzed surface soil and surface water for explosives (SW8321 for 8330 list + NG and PETN) and TAL metals (combination of SW6010/6020/7470/7471)

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Study Outline

- Soil composite scheme: 4 diamond-points
- Depth: 0-2 inches
- Surface water downstream of site
- Limited soil pH and classification data
- Limited water hardness data
- Limited background sample collection at each site
- Compare to most stringent of Region III/VI/IX residential/industrial screening levels and ecological screening levels to indicate relevance of results

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Former Camp Beale: Site Description

- Located near Sacramento, CA
- Property used 1940-1956
- Sampled two former Open Burn/Open Detonation Areas
- No previous MMRP actions at this location

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Former Camp Beale: Preliminary Results

- Soil detects above human health criteria:
  - Arsenic (BG > criteria)
  - Iron (also > ecological, BG > criteria)
  - Manganese (also > ecological)
  - Vanadium (also > ecological, BG > criteria)
- Soil detections above ecological criteria
  - Aluminum (BG > criteria)
  - Chromium (BG > criteria)
  - Cobalt (BG > criteria)
  - Copper (BG > criteria)
  - Lead (BG > criteria)
  - Nickel (BG > criteria)
  - Selenium
  - Zinc
- Soil: Silty sand / pH 6.2-6.3
- Surface water detects above criteria:
  - Aluminum (human)
  - Arsenic (both)
  - Chromium (ecological)
  - Cobalt (ecological)
  - Copper ecological)
  - Iron (human)
  - Lead (ecological)
  - Manganese (human)
  - Nickel (ecological)
  - Vanadium (both)
  - Zinc (ecological)
- Hardness 77-190 mg/L
- pH 5.52 – 9.18
- No explosives detected in surface soil or surface water

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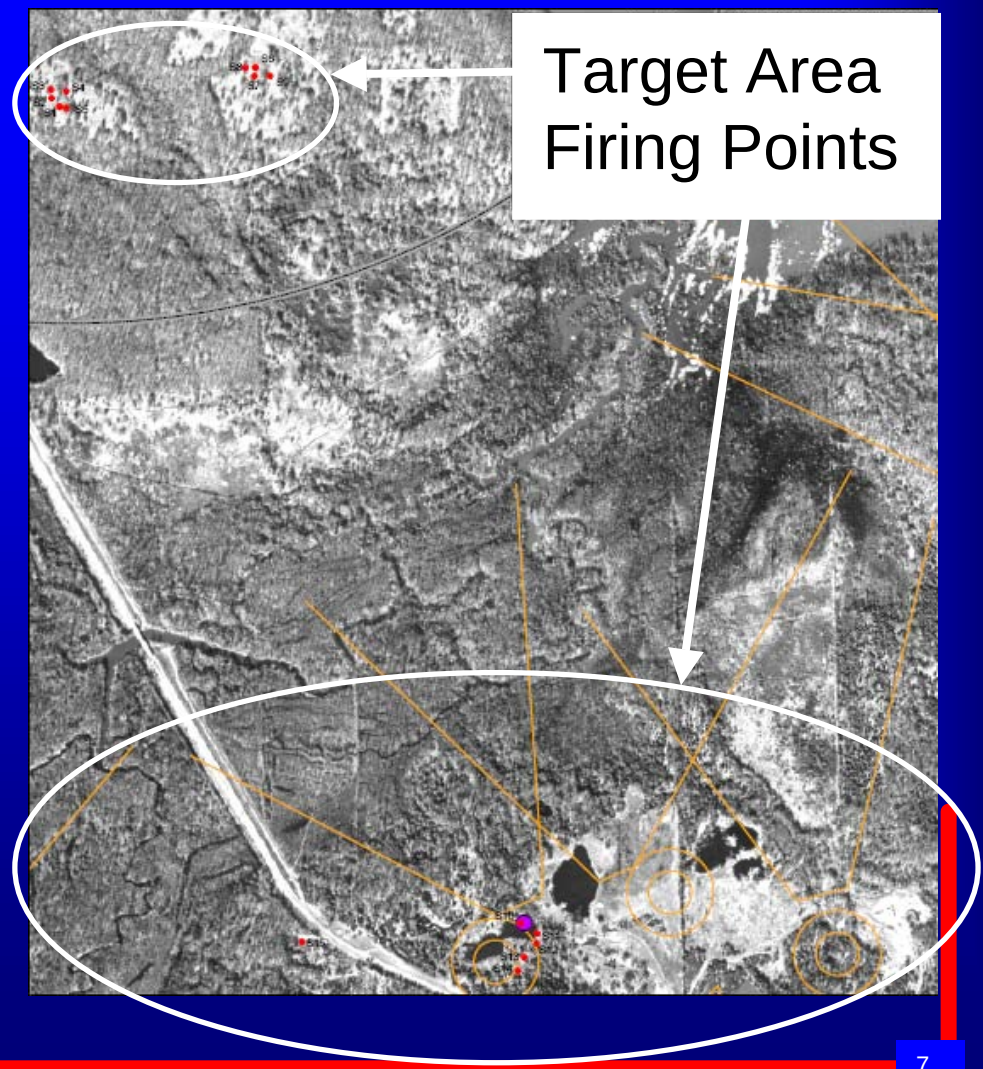
Former Camp Maxey: Site Description

- Located near Paris, TX
- Used 1942-1945
- Sampled West Impact Area (located on Pat Mayse Dam property)
- Numerous munitions response actions in the adjacent private property
- MEC Findings:
  - Rockets
  - Mortars
  - Grenades
  - Artillery rounds



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Former Camp Maxey: Preliminary Results

- Only metal detected above residential human health criteria – arsenic (BG > criteria)
- Soil detections above ecological criteria:
  - Aluminum (BG > criteria)
  - Beryllium
  - Chromium
  - Manganese
  - Selenium
  - Vanadium (BG > criteria)
- Soil: Silty sand and lean clay with sand
- Soil: pH 5.0-8.3
- Surface water detects above criteria:
  - Aluminum (human, BG > criteria)
  - Arsenic (both, BG > criteria)
  - Iron (human, BG > criteria)
  - Manganese (human, BG > criteria)
  - Sodium (human)
- Hardness 22-210 mg/L
- pH 5.79 – 7.04
- No explosives detected in surface soil or surface water

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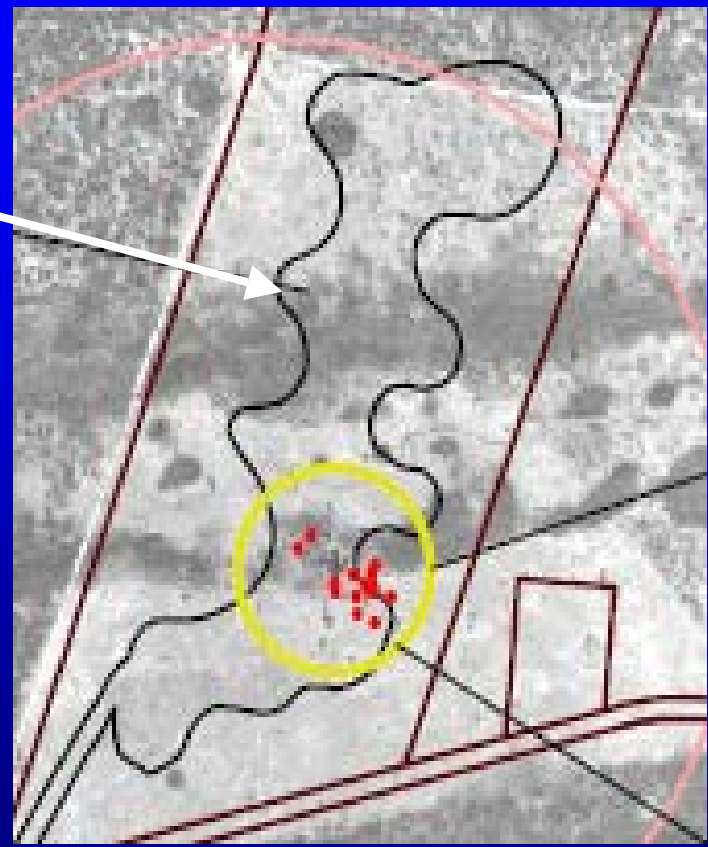
Former Conway B & G Range: Site Description

- Located in Conway, SC
- Used 1941-1947
- Previously TCRA conducted
  - 4-lb and 6-lb incendiary bombs
  - 2.25 inch rockets
  - 20-lb fragment bombs
  - 5-inch high velocity aircraft rockets (HVARs)
  - 100-lb practice bombs
  - 250-lb bomb



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Former Conway B & G Range: Preliminary Results

- No explosives detected in surface soil or surface water
- Soil: Silty sand and poorly graded sand with silt
- Soil: pH 3.8-4.9
- Only metal detected above residential human health criteria – arsenic
- Surface soil detects above ecological criteria:
  - Aluminum (BG > criteria)
  - Antimony
  - Cadmium
  - Chromium
  - Lead
  - Mercury (BG > criteria)
  - Selenium
  - Vanadium (BG > criteria)
  - Zinc

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Former Conway B & G Range: Preliminary Results

- Surface water detects above criteria:
  - Aluminum (human)
  - Arsenic (both)
  - Cobalt (ecological)
  - Iron (human)
  - Lead (ecological)
  - Manganese (human)
  - Nickel (ecological)
- Hardness 38-160 mg/L
- pH 3.36-5.55

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Southwestern Proving Ground: Site Description

- Located in Hope, AR
- Used 1942-1945
- Sampled Old Dry Target Lake Range
- Previously conducted Removal Action
- MEC Findings:
  - Various configurations of 4.5-inch Rocket Warhead
  - 20 lb fragmentation bomb

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Southwestern Proving Ground: Preliminary Results

- Only metal detected above residential human health criteria – arsenic
- Soil detections above ecological criteria:
  - Aluminum (BG > criteria)
  - Beryllium
  - Chromium (BG > criteria)
  - Lead
  - Manganese (BG > criteria)
  - Selenium (BG > criteria)
  - Vanadium (BG > criteria)
  - Zinc
- Soil: Silty sand and elastic silt with sand
- Soil: pH 5.3-7.3

- Surface water detects above criteria:
  - Aluminum (human)
  - Arsenic (both)
  - Cobalt (ecological)
  - Iron (human)
  - Lead (ecological)
  - Manganese (human)
  - Vanadium (ecological)
- Hardness 20-97 mg/L
- pH 6.10-6.26

- No explosives detected in surface soil or surface water

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Former Camp Elliott: Site Description

- Located near San Diego, CA
- Used 1918-1944
- Sampled projectile impact area in East Elliot
- Numerous munitions response actions in the adjacent property
- MEC Findings:
  - HE projectiles (75 mm and 37 mm rounds)
  - M67 105mm HEAT projectile
- Sampled surface soil only for explosives and metals (no surface water bodies available)

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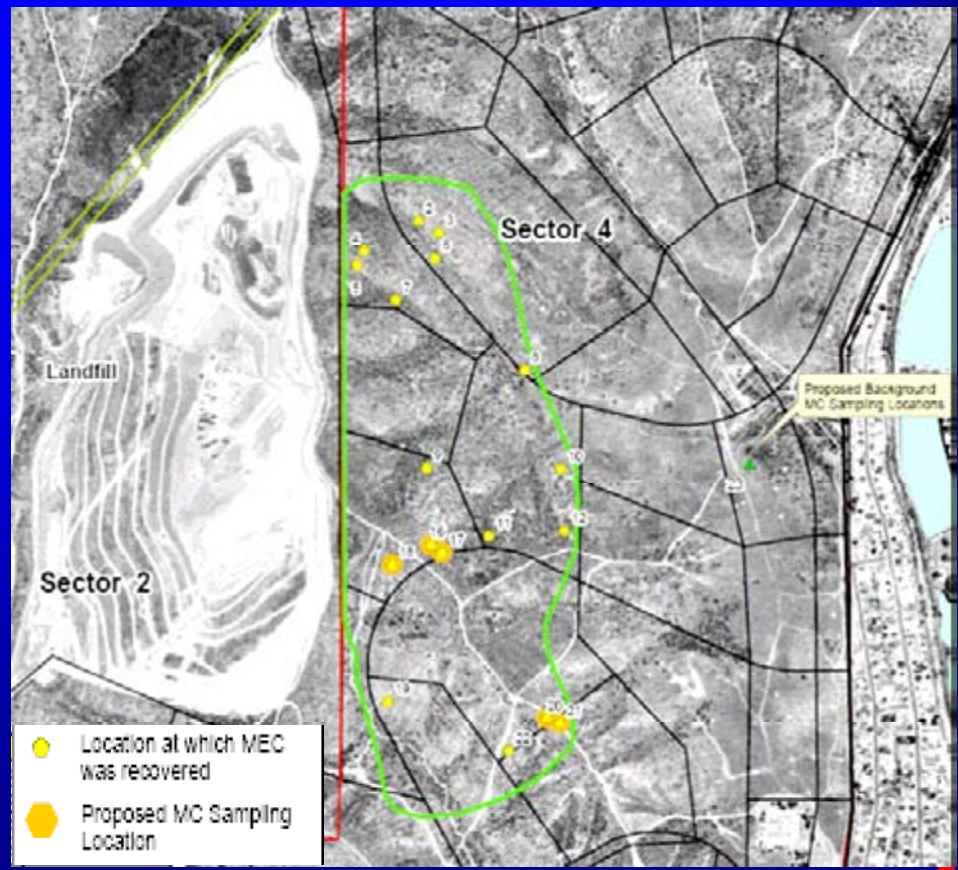
Former Camp Elliott: Preliminary Results

- No explosives detected in surface soil
- Soil detections above human health criteria:
  - Arsenic (also > ecological) (BG > human criteria)
  - Manganese (also > ecological) (BG > ecological criteria)
- Soil detections above ecological criteria
  - Aluminum (BG > criteria)
  - Barium
  - Chromium (BG > criteria)
  - Lead
  - Selenium (BG > criteria)
  - Vanadium (BG > criteria)
- Soil: Silty sand and clayey sand
- Soil: pH 5.8-6.1



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Former Camp Butner: Site Description

- Located near Durham, NC
- Used 1942-1943 (18 months)
- Site has had EE/CA and TCRA
- MEC Findings:
  - 155mm, 105mm, 57mm, and 37mm projectiles
  - 2.36-inch bazooka rockets
  - Mk II hand grenade
  - M1 practice mine

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Former Camp Butner: Preliminary Results

- No explosives detected in surface soil or surface water
- Soil detections above human health criteria:
  - Arsenic (BG > criteria)
  - Iron (BG > criteria)
  - Manganese (also > ecological) (BG > ecological criteria)
  - Vanadium (also > ecological) (BG > both criteria)
- Soil detections above ecological criteria:
  - Aluminum (BG > criteria)
  - Chromium (BG > criteria)
  - Copper
  - Lead (BG > criteria)
  - Selenium
  - Zinc
- Soil: Silty sand, silty sand with gravel, silt with sand
- Soil: pH 4.7-5.4

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Former Camp Butner: Preliminary Results

- Surface water detects above criteria:
  - Aluminum (human)
  - Arsenic (human)
  - Iron (both)
  - Manganese (human)
- Hardness 22-38 mg/L
- pH 6.73 – 9.7

Metal Constituents in Filler of MEC at Six FUDS

FUDS ID	Metal Constituents in Filler of MEC Identified Onsite
Camp Beale	Antimony, **Lead**, Potassium, Magnesium, **Iron**, Barium, **Zinc**, Titanium, Phosphorous
Camp Maxey	Antimony, Lead, Potassium, Magnesium, **Iron**, Barium, Phosphorous
Conway B&G Range	**Lead**, Barium, Potassium, Magnesium, Barium, **Zinc**, **Cadmium**, Phosphorous, **Mercury**
SWPG	**Lead**, Potassium, Barium, Mercury
Camp Elliott	Antimony, **Lead**, Potassium, Magnesium, **Barium**, Phosphorous
Camp Butner	Antimony, **Lead**, Barium, Potassium, Magnesium, Phosphorous

Note: Metal Constituents highlighted were detected above criteria.

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Preliminary Conclusions of Study

- No explosives detected in surface water or surface soil
- Metals results > ecological criteria, but most < human health, residential criteria
- Very limited assessment of background conditions show many background concentrations are similar to site sample concentrations for metals, but may be insufficient to conclusively write them off
- Final conclusions will include the MEC data as part of the evaluation

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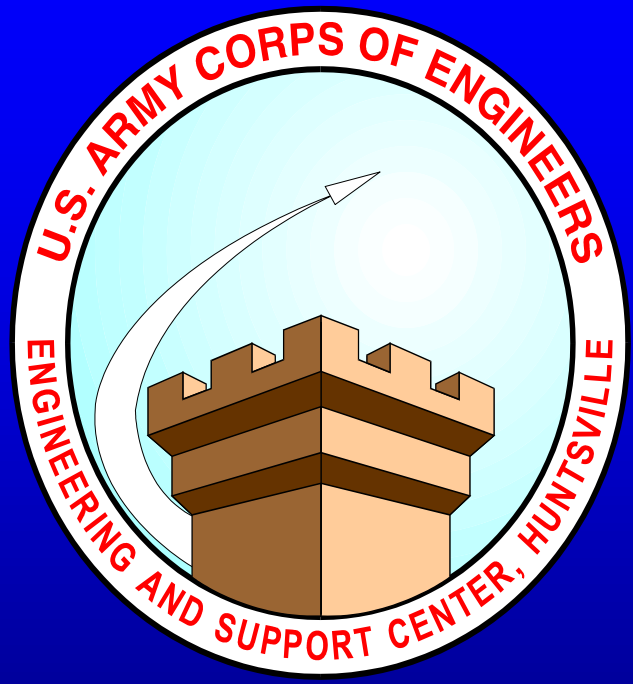
Any Questions?



Backup Slides

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Explosives Compounds included in the Study

- 1,3,5-Trinitrobenzene
- 1,3-Dinitrobenzene
- 2,4,6-Trinitrotoluene (TNT)
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- 2-Amino-4,6-Dinitrotoluene
- 2-Nitrotoluene
- 3-Nitrotoluene
- 4-Amino-2,6-Dinitrotoluene
- 4-Nitrotoluene
- Hexahydro-1,3,5-Trinitro-1,3,5-Triazine (RDX)
- Methyl-2,4,6-TrinitrophenylNitramine (Tetryl)
- Nitrobenzene
- Nitroglycerine (NG)
- Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine (HMX)
- Pentaerythritol Tetranitrate (PETN)

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Metals included in the Study

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Nickel
- Potassium
- Selenium
- Silver
- Sodium
- Thallium
- Vanadium
- Zinc

Study SOW Criteria

Analyte	Abbreviation	Class	Surface Water (µg/L)	Soil (mg/kg)
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	Explosives	0.61	4.4
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	Explosives	330	3100
2,4,6-Trinitrotoluene	2,4,6-TNT	Explosives	2	16
1,3,5-Trinitrobenzene	1,3,5-TNB	Explosives	14	1800
1,3-Dinitrobenzene	1,3-DNB	Explosives	1	6.1
2,4-Dinitrotoluene	2,4-DNT	Explosives	0.099	0.72
2,6-Dinitrotoluene	2,6-DNT	Explosives	0.099	0.72
2-Amino-4,6-dinitrotoluene	2-Am-DNT	Explosives	7.3	16
2-Nitrotoluene	2-NT	Explosives	0.046	2.8
3-Nitrotoluene	3-NT	Explosives	61	370
4-Amino-2,6-dinitrotoluene	4-Am-DNT	Explosives	7.3	16
4-Nitrotoluene	4-NT	Explosives	0.62	38
Nitrobenzene	NB	Explosives	3.4	20
Nitroglycerin	NG	Explosives	4.8	35
Methyl-2,4,6-trinitrophenylnitramine	Tetryl	Explosives	360	610
Pentaerythritol Tetranitrate	PETN	Explosives	NE	NE

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Study SOW Criteria

Analyte	Abbreviation	Class	Surface Water (µg/L)	Soil (mg/kg)
Aluminum	Al	Metals	50	76000
Antimony	Sb	Metals	6	31
Arsenic	As	Metals	0.045	0.39
Barium	Ba	Metals	2000	5400
Beryllium	Be	Metals	4	150
Cadmium	Cd	Metals	5	37
Calcium	Ca	Metals	NE	NE
Chromium	Cr	Metals	100	210
Cobalt	Co	Metals	730	900
Copper	Cu	Metals	1000	2900
Iron	Fe	Metals	300	23000
Lead	Pb	Metals	15	400
Magnesium	Mg	Metals	NE	NE
Manganese	Mn	Metals	50	1600
Nickel	Ni	Metals	100	1600
Potassium	K	Metals	NE	NE
Selenium	Se	Metals	50	390
Silver	Ag	Metals	100	390
Sodium	Na	Metals	2000	NE
Thallium	Tl	Metals	2	5.2
Vanadium	V	Metals	11	23
Zinc	Zn	Metals	2000	23000
Mercury	Hg	Metals	2	23